



Glenn Research Center • Cleveland • Ohio

# Technology Opportunity

Commercial Technology Office

TOP3-00147

## Acoustical Testing Laboratory

### Technology

The Acoustical Testing Laboratory (ATL) provides a variety of acoustical testing services to support verification requirements and low-noise design programs for space flight hardware and commercial products.

### Background

Space flight hardware and science experiment payloads must meet stringent acoustic emission requirements. These requirements support hearing conservation, speech communication, and mission safety goals, as well as prevent noise-induced vibrations from deteriorating the on-orbit microgravity environment. Payload acoustic emissions must be test-verified before launch, and frequent testing is also a critical element in a low-noise design process that allows payloads to successfully meet these requirements. The ATL at the NASA Glenn Research Center (GRC) in Cleveland provides acoustic emission testing services for the International Space Station (ISS) and other NASA projects.

### Services

The ATL is available to NASA organizations, payload contractors, and commercial clients. The ATL provides a comprehensive array of acoustical testing services, including sound pressure level measurement, sound power level determination, and sound intensity studies on test articles ranging from individual components to full rack payloads. In addition, low-noise design services are offered, which combine a progressive testing program with expert acoustical engineering to help customers meet their acoustic emissions requirements.

### Technology Description

The ATL is unique among NASA facilities. It is the only anechoic test facility agencywide that is dedicated to supporting the development and qualification of space flight hardware. The anechoic test environment, data acquisition system, and signal processing capabilities of the ATL are state of the art among both government and private sector

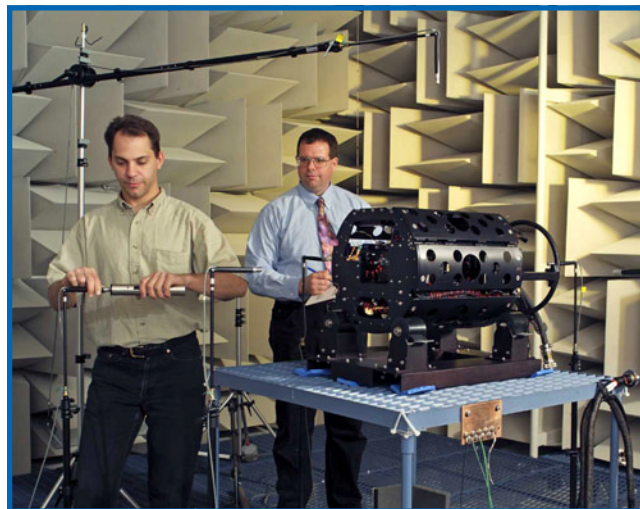
laboratories. Our engineering and consulting staff has the background and experience to assist clients with their acoustical design and testing needs.

### Accreditation

The ATL is accredited by the National Institute of Standards and Technology under the National Voluntary Laboratory Accreditation Program (NVLAP Code 200557-0) for sound power determinations per ISO 3744.

### Benefits

- The ATL offers accurate and repeatable measurements on even the smallest and quietest noise sources.
- The ATL's ISO 17025 quality program ensures the professional integrity and technical competence of every ATL service.
- Acoustical engineering services assist customers with materials selection, noise budgeting, and design strategies.
- ATL customers benefit from specialized educational resources, including design guides, technical workshops, and multimedia instructional products.



*Calibrating the measurement system prior to a sound pressure level study at the NASA GRC ATL.*

## Facility Description

The ATL consists of a fully vibration-isolated anechoic/hemianechoic test chamber with 21-by 17-foot-high interior working dimensions. A 36-inch deep fiberglass anechoic wedge treatment with a high-open-area perforated metal facing provides 99 percent normal incidence sound absorption at frequencies at and above 100 Hz. Measurements at frequencies as low as 50 Hz can be conducted with engineering grade precision.

Removable floor wedge carts allow the facility to be configured as either a hemianechoic or fully anechoic chamber. The test chamber has double doors (9- by 10 ft) for rack and equipment access. A removable ceiling plug (8- by 8 ft) provides crane access for working with large test articles. A separate, sound-isolated control room houses the data acquisition system and can double as a mechanical room for test articles with noise-emitting support equipment.

## Measurement Capabilities

The ATL's PC-based data acquisition system provides up to 26 channels of simultaneous data acquisition with real-time one-third octave band and FFT measurements. A scanning sound-intensity system provides the capability of identifying noise sources and detecting acoustic leaks as part of a low-noise design process. The ATL also offers a variety of specialized diagnostic measurements to support our clients' low-noise design efforts. Test articles may be instrumented to provide accelerometer, modal hammer, shaker, and interior microphone (for TL-type measurement) data.

Custom software designed specifically for the ATL automates the test documentation, data acquisition, analysis, and reporting of results for fast and accurate transmission of data to ATL clients.

## Commercial Applications

In addition to serving the needs of NASA and its payload contractors, the ATL's testing and acoustical engineering services are available to support commercial products. The same low-noise design principles used by NASA to build flight hardware, of which acoustic emissions testing is a key component, result in quieter products for our commercial clients. Quieter products contribute to a safer, more productive, and more comfortable work environment. Products and equipment with low noise emissions pose less risk to the end user and are more

economical because they operate more efficiently. When noise sources have been identified and reduced early in the design process, these products will require fewer costly "fixes" in the form of acoustical materials, which also consume valuable weight and space.

## Contact

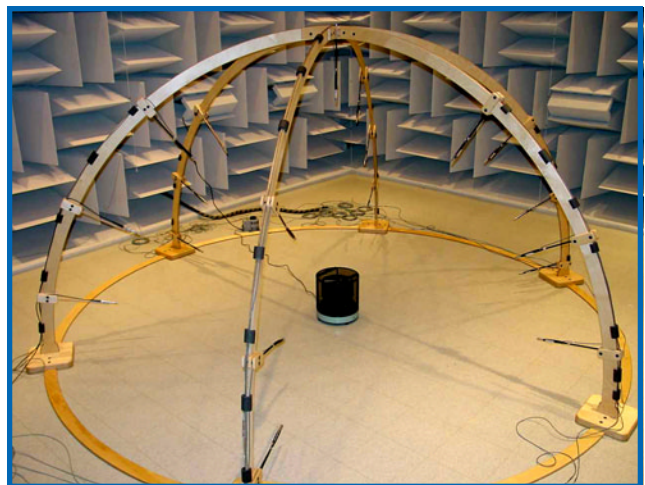
Technology Transfer & Partnership Office  
NASA John H. Glenn Research Center  
at Lewis Field  
Mail Stop 4-2  
Cleveland, OH 44135-3191  
Phone: 216-433-3484  
Fax: 216-433-5012  
E-mail: [ttp@grc.nasa.gov](mailto:ttp@grc.nasa.gov)  
<http://technology.grc.nasa.gov>

## References

<http://acousticaltest.grc.nasa.gov>

## Key Words

Acoustic emissions testing  
Anechoic chamber  
Low-noise design  
Acoustical Testing Laboratory  
Sound power level  
Hemianechoic chamber  
Noise emission  
Hearing conservation  
Flight hardware requirements  
International Space Station noise



*A 19-microphone array for sound power level determination in the ATL.*